planation. Such a result might be expected when we consider the difficulties of the question. The student should understand that he must face the difficulties, and that he can not overcome them without serious study. A good analytical exposition will be found in the 'Mecanique' of Poisson. But the most satisfactory investigation of such motions is given by Poinsot, by means of the theory of couples. An interesting example is that of the precession and nutation of the equinoxes. If we form the couples around the earth's axis of rotation, around the line of equinoxes, and around the line in the earth's equator, directed toward the solstice; we find that the couple around the axis of rotation is zero; the couple around the line of equinoxes gives the precession; and the couple around the other axis produces the nutation. By substituting the force arising from the action of the sun, expanding by the binomial theorem, and retaining only the first terms, the solar precession comes out 15″.6 in a year. The calculation for the moon is not so easy because the moon does not move in the ecliptic; but, since we can compound couples like forces, there is no difficulty except the length of the work. The precession produced by the moon is 34″.8: hence the sum, or the luni-solar precession is 50″.4. Observation gives 50″.35; this simple method therefore gives a good approximation to the true value.

The mass of the earth disappears when we compound the couples, and the precession would be the same if the earth were a shell of the same figure. The precession has a secular character, since when we integrate we find a constant factor multiplied by the time. Again, since the precession is negative, the dynamical result shows that the earth is flattened at the poles, and not elongated as Cassini thought.

The nutation can be found in the same way from the couple around the third axis, but it has a periodical character, and changes sign with the longitude of the moon. The computed value agrees well with observation.

Poinsot's work is a remarkable example of what can be done by the careful study and examination of the geometrical conditions of a question.

A. HALL.

CAMBRIDGE, May 31, 1901.

MODULUS OF CONSTANT CROSS SECTION.

TO THE EDITOR OF SCIENCE: In the last number of SCIENCE there appears a short article with the above heading, in which the author says he can find no mention anywhere of a modulus of constant cross section. The modulus here referred to will be found in a number of treatises on elasticity, among others the article 'Elasticity,' in 'Encyclopædia Brittanica,' Vol. VII., p. 807, and Rankine's 'Applied Mechanics,' p. 279, where a numerical value is quoted for brass. If k be the volume modulus and n the rigidity modulus the modulus for constant cross section is $k + \frac{4}{3} n$.

The author may profit by the study of the thermodynamics of elasticity as given in the 'Britannica' article.

THOMAS GRAY.

ROSE POLYTECHNIC INSTITUTE,
May 27, 1901.

NOTE ON THE GENUS HOLLANDIA OF KARSCH.

IN reading over the sixth volume of the Cambridge Natural History (Insects) by Dr. David Sharp, p. 396, the writer notes the following statement: "The tropical African Arbelidæ are considered by Karsch to be a distinct family, Hollandiidæ."

Upon looking up the matter I discover that Dr. F. Karsch, in the twenty-second volume of the 'Entomologische Nachrichten' (1896), p. 137, erected a genus in honor of Dr. W. J. Holland, of Pittsburgh, calling it *Hollandia*, and selecting as the type of the genus the species named and described by him as *Hollandia togoica*. He further made this genus the type of a new family, the *Hollandiidæ*, to which he referred the genera *Hollandia* Karsch, *Arbelodes* Karsch, *Lebedodes* Holland, and *Metarbela* Holland.

Dr. Karsch unfortunately overlooked the fact that in the *Annals and Magazine of Natural History* for October, 1892 (p. 295), Dr. Arthur G. Butler had already described a genus of African moths, naming it *Hollandia*, in honor of the same gentleman, whom Dr. Karsch states it to be his wish to recognize. Dr. Karsch's name, therefore, falls into the list of synonyms together with the family name, which he has proposed.

The writer suggests for the genus described